Max Planck Institutes Brace for Change

With funding for life and no teaching requirements, top Max Planck researchers are in an enviable position. But tight budgets and a new generation may bring reforms in the system that some say are overdue

MUNICH—For the Max Planck Society (MPS), the announcements earlier this month that two of its researchers had been awarded Nobel Prizes was cause for celebration. But it probably wasn't a great surprise. In fact, Germany's premier basic research organization is getting used to sharing in the October honors: This year's awards to developmental biologist Christiane Nüsslein-Volhard and atmospheric chemist Paul Crutzen (*Science*, 20 October, p. 380) bring to 30 the number of Nobelists who have worked at Max Planck Institutes (MPIs). Ten MPS researchers have won the prize in the past 11 years alone.

Few research organizations can boast such a record. But then, few provide the kind of unfettered environment for doing science that the MPS offers. Its senior scientists, known as directors, get lavish support for life—freeing them from the pressures of grant applications, university committees, and teaching. Indeed, the MPS has been so successful that several organizations, including the Howard Hughes Medical Institute in the United States and Britain's Wellcome Trust, have adopted its idea of strongly supporting a few outstanding researchers.

With this track record, any talk of changing the MPS might seem misguided. Yet some scientists say change is needed—especially given the country's new circumstances. As the MPS expands into former East Germany and helps build up its science, research money in the west is much tighter. That makes it harder to keep—and to justify—a system where directors get funds for life, regardless of their productivity. Reformers also favor doing more for young scientists and relaxing the strong focus on directors. "The Max Planck is very old-fashioned in the way [directors] are selected, get money, the way quality is controlled," says Nüsslein-Volhard, a director at the MPI for Developmental Biology in Tübingen. "They treat you like you're a genius, whether it's true or not."

All these pressures are mounting just as MPS's top echelon is about to turn over. A wave of retirements will see one quarter of the 222 directors replaced by a new generation over the next 5 years. And zoologist Hubert Markl, the first "outsider" ever elected MPS president, will take over next June (see box). That's why, says one MPS scientist, "it's now or never if we want to change the system."

Eastern expansion

Created in 1911 as the tiny, elite Kaiser Wilhelm Society, the MPS has over the years built institutes around some of the century's leading scientists, including Albert Einstein, Otto Meyerhof, and Werner Heisenberg. Today it is big business: MPS supports 69 institutes with a 1995 budget of $1.2 billion from the federal and state governments. That puts it on a par with Germany's largest granting agency. And there's the dilemma, says Ernst-Ludwig Winnacker of the University of Munich (and associate member of the MPI for Biochemistry in Martinsried)—"whether the current [MPS] structure, devised in 1911 to build institutes around a few genius scientists, can always be applied today."

MAX PLANCK SOCIETY'S NOBELISTS

Max von Laue	1914	Physics
Richard Willstätter	1915	Chemistry
Fritz Haber	1918	Chemistry
Max Planck	1918	Physics
Albert Einstein	1921	Physics
Otto Meyerhof	1922	Medicine
James Franck	1925	Physics
Otto Warburg	1931	Medicine
Carl Bosch	1931	Chemistry
Werner Heisenberg	1932	Physics
Hans Spemann	1935	Medicine
Petrus Debye	1936	Chemistry
Richard Kuhn	1938	Chemistry
Adolf Butenandt	1939	Chemistry
Otto Hahn	1944	Chemistry
Walther Bothe	1954	Physics
Karl Ziegler	1963	Chemistry
Feodor Lynen	1964	Medicine
Manfred Eigen	1967	Chemistry
Konrad Lorenz	1973	Medicine
Georges Köhler	1984	Medicine
Klaus von Klitzing	1985	Physics
Ernst Ruska	1986	Physics
Robert Huber	1988	Chemistry
Johann Deisenhofer	1988	Chemistry
Hartmut Michel	1988	Chemistry
Erwin Neher	1991	Medicine
Bert Sakmann	1991	Medicine
Christiane Nüsslein-Volhard	1995	Medicine
Paul Crutzen	1995	Chemistry

That question had already been in the air "for ages," says one former MPS researcher, when the fall of the Berlin Wall confronted the MPS with new realities. After East and West Germany were reunited in 1990, the government looked to its research organizations to help rejuvenate the east's dilapidated science and pressured the MPS to open new institutes quickly. But the MPS leadership balked at abandoning the society's policy of starting institutes only where strong science and a good local infrastructure already exist, says the MPS's current president, law specialist Hans Zacher. The result was a compromise: First, the MPS would set up small research groups around promising university scientists for 5 years. Then, as local conditions improved, they would build institutes—all with new money, saving MPIs in the west from massive cuts.

Initially, universities and scientists welcomed the 27 new groups. "Compared to the [East Germany] days, this is almost like a dream," says Johann Dorschner of the MPS astronomy group at the University of Jena. But the honeymoon didn't last long. With the first groups nearing the end of their 5 years' support, the universities have backed away from promises to absorb group members and not just the leaders, says Zacher. And that threatens to break up teams just as they are hitting their stride. With no overall solution in sight, the MPS and universities are negotiating person by person, says Zacher, and the MPS will support a third of the remaining people for three more years.

Meanwhile, the MPS has founded nine institutes in the east, in fields from gravitational physics to the history of science. Plans for two more are approved, and the goal is to establish another five or six, says Zacher. But it has been tough going. "It's difficult to attract [outside] people to the former east," says neuropsychologist Angela Friederici, who left a professorship at Berlin's Free University for an MPI directorship in Leipzig. "It will take time for the universities to reach the level of those in western Germany," she says.

Retrenchment in the west

Back west, reunification has meant tighter money for public institutions across the board, and the MPS is no ex-

Hubert Markl: Animal Behaviorist Puts His Learning to Work

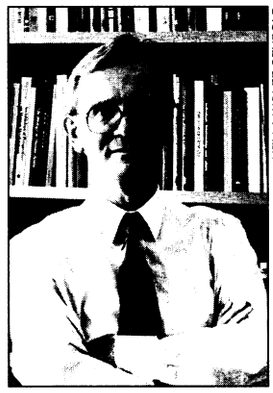
BERLIN—At a time when the pressure for change is buffeting the Max Planck Society (MPS) from many sides (see main text), Germany's foremost research organization has for the first time chosen someone from outside its own ranks to take the helm: zoologist Hubert Markl. He may be an "outsider" to the MPS, but Markl is no stranger to the German scientific community. While holding down a professorship at the University of Konstanz near the Swiss border for the past 2 decades, Markl has also been a newspaper columnist, an essayist on scientific ethics, the head of Germany's main granting agency, and president of the reorganized Berlin-Brandenburg Academy of Science—the successor to the prestigious former Prussian Academy of Science.

Colleagues describe him as a formidable intellect, a "spell-binding speaker," a philosopher of science, a good administrator, and "a politician in the best sense of the word." He will need all those talents when he takes over the MPS presidency next June, as the organization struggles to cope with tight budgets and the challenge of opening new institutes in Germany's eastern states.

Born in Bavaria in 1938, Markl studied science at the University of Munich, earning his Ph.D. in zoology in 1962. He did postgraduate work at Harvard University and Rockefeller University in 1965–66, and directed a German zoological institute before becoming a biology professor at Konstanz University in 1974. Much of his research has focused on animal communication. He has also studied how some insects develop complex social systems from simple beginnings, and is fascinated by the way individual ants and bees contribute to their complex hives and colonies by "optimizing their behavior and their goals." It is an observation he keeps in mind when analyzing human organizations. As a leader, Markl said in an interview with *Science*, he tries to ascertain "whether something you want to achieve is better achieved if you just let the individuals do their thing, or whether you have to impose centralized planning. ... Leadership from the top, in conjunction with 'bottom-up' independence, can provide the best solution."

Markl has served on the governing board of the DFG, Germany's basic research granting agency, since the 1970s, and was the organization's president from 1986 to 1991. In 1993, as the Berlin authorities struggled to weld together the scientific traditions of east and west, Markl became founding president of the Berlin-Brandenburg Academy, a post he relinquished last month. There he helped organize interdisciplinary working groups that joined prominent scientists from both sides of the old border. "The greatest challenge was to bring together scientists with such different biographical backgrounds into a situation where they can work together again," Markl said. Detlev Ganten, who also had to grapple with merging east and west as head of the Max Delbrück national research center near Berlin, says Markl "mastered the situation." Ganten describes Markl as "politically savvy, yet able to project freshness and openness."

Those skills attracted the attention of a search committee of Max Planck's governing board, whose 55 members cast written ballots this summer to ratify Markl as the new president. While Markl is hesitant to define specific plans for the MPS before his term as president begins, he told *Science* in two recent interviews that he wants "to make sure there will be more emphasis on concentrating resources in centers of excellence" and more clearly defining the missions of scientific institutions. He also wants to foster more cooperation and joint projects between Max Planck institutes and the traditionally separate university system. And he advocates a bit more freedom for talented young scientists chafing to do independent research, although he says such decisions should be made on a case-by-case basis.



HELLA WOLFF-SEYBOLD

Insiders' outsider. Markl, the first president from outside the MPS, will take up the chain of office *(left)* in June.

Markl makes clear that he plans to help encourage more women to rise as scientific researchers. "We have to consider this as a major challenge in the next decade," said Markl, who sees far too few women in the higher levels of the MPS. "Things are moving, but they are moving glacially."

As for the east, Markl wants the MPS to establish enough new institutes so that—by the turn of the century—the representation in the east will be roughly proportional to that of western Germany. But he concedes that, if German federal and state governments do not live up to budget commitments, then "it will be very difficult" to bring eastern Germany to that level.

"Max Planck was founded to be ... as good as any institution in the world," Markl says. "To do the best research that can be done, to attract the best people, and give them the best opportunities. This will be my major goal."

–Robert Koenig

Robert Koenig is a science writer in Berlin.

ception. For an organization used to "swimming in money," says an MPS astronomer, the change has been tough. So far, savings have been made by closing selected research areas as their directors retire, says Zacher, a trend that will continue. Beyond this, all institutes face staff cutbacks—a worrisome solution, says Steven Beckwith, a director at the MPI for Astronomy in Heidelberg, as it hits mostly young scientists on fixed-term contracts. "If we cut back positions, my whole group vanishes," he says.

But some researchers believe that the system could benefit from a bit of belt-tightening. Molecular biologist Benno Müller-Hill of the University of Cologne carried out a detailed comparison of two MPIs with 11 other German and foreign research departments and institutes and found that the MPS system costs more than twice as much to produce highly cited papers as, for example, his own university department, the Cold Spring Harbor Laboratory on Long Island, New York, or Heidelberg's European Molecular Biology Laboratory.

One consequence of the squeeze is that future cuts will be tied more closely to research productivity, says Thomas Trautner of the MPI for Molecular Genetics in Berlin, one of four MPS vice presidents. "There is a broad consensus among Max Planck directors that this is the way to proceed," he says.

Along with the debate on cutbacks, another long-standing taboo subject is being openly discussed: the idea that directors should receive part of their funding through quality assessment or project proposals. Although no sudden policy shift is likely, says one insider, "the discussion is heating up."

Says one MP biologist who requested anonymity: "You can't go on funding research with little coming out at the end."

On the other side, supporters of the status quo say it promotes harmony. "At the moment, the pie is divided rather equitably," says Ken Holmes, a director at the MPI for Medical Research in Heidelberg. "I prefer this to the kind of feuding that would come with [a more formal review system]. It won't save enough money to make it worthwhile." Others argue that freedom from competition for funds allows directors to start risky projects without being under pressure to publish.

Small is beautiful

Perhaps the thorniest issue for the MPS is the tradition of powerful directors building up research groups that can reach the size of a typical university department. Several physicists interviewed by *Science* argued that big groups are crucial for some large-scale projects. But many biologists felt that institutes with lots of independent groups using different systems are more in tune with the times. "People want independent colleagues, not lots of junior groups dependent on you," says Nüsslein-Volhard.

And at present there are few chances for young people to be formally independent. "[The MPS] can be very stifling to up-and-coming scientists," says biochemist Walter Hill of the University of Montana, an adviser to Berlin's MPI for Molecular Genetics. "It throws a blanket over other people ... [and] encourages them to become puppets of the director." Of the MPS's 2800 scientists below director level, only 30 are officially independent group leaders with their own resources.

Working under a director has been fine for some. Take Hartmut Michel, now a director at the MPI for Biophysics in Frankfurt. Michel was working in Dieter Oesterhelt's group in the early 1980s when he took on a project other scientists thought was impossible: crystallizing a protein from the cell membrane. His work on the photosynthesis reaction center won him and two MPS collaborators the 1988 Nobel in chemistry. Michel says that continuous funding and topnotch facilities were "absolutely decisive" to his success. "[The MPS] makes your life as easy as possible," he says. Similarly, neither Bert Sakmann nor Erwin Neher were formally independent when they developed a technique for measuring the flow of ions through single nerve channels—research that earned them the 1991 Nobel Prize in medicine.

But for the less lucky ones, life at an MPI can be frustrating or—in extreme cases—disruptive to their careers. When a director retires or dies, says one MPS researcher who requested anonymity, "the leftover people all scramble for a foothold." And, although there are many such "leftover" staff—some 20%, according to several estimates—they have no real place in the system. In fact, some say the institutes often try to push them out, regardless of the quality of their work. "I don't expect a free lunch," says one researcher. "What I object to is getting kicked in the butt."

Some MPS leaders dismiss criticism of these harsh realities. "The director has a lot of freedom to structure his department," says Vice President Trautner. "This is entirely adequate to encourage young people." To avoid leftovers, he favors drastically reducing the number of permanent positions for non-directors. Others see a solution in creating a tenure-track, middle level of independent researchers. Besides nurturing young talent, says Nüsslein-Volhard, it would allow institutes to cover more areas. And it would prepare more women for top posts in the MPS, she says, where they are abysmally underrepresented—a problem common throughout German research.

With change in the air, it is perhaps the perfect moment for a man like Markl to take over: someone not steeped in MPS traditions, yet a formidable intellect and a skillful politician. What's more, says Nüsslein-Volhard, "he might not assume we're all geniuses."

–Patricia Kahn

With reporting from Robert Koenig.

PLANETARY SCIENCE

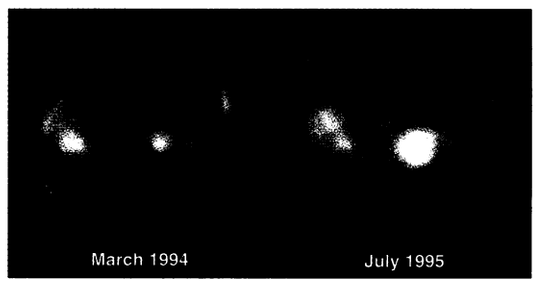
Galileo Lives With Balky Tape Recorder

Sooner or later, it happens to everyone who has a tape recorder. You push the button on your machine and nothing happens. A moment later, you try again, and it works. Engineers operating the Galileo spacecraft that is nearing Jupiter know the feeling. On 11 October, they found that the recorder that is supposed to store data for eventual transmission to Earth was stuck. Just like frustrated audiophiles, they backed off and tried their tape recorder again. Now it seems to be working—to the engineers' great relief.

"We have a good idea of what the problem is and good ideas of how to work around it" to keep the tape recorder rolling smoothly, says manager William O'Neil of the Jet Propulsion Laboratory (JPL) in Pasadena, California. If he's right, Galileo will once again have dodged a technical obstacle threatening the $1.3 billion mission.

The balky tape recorder is central to plans for making up for the failure of Galileo's main communications antenna to open fully (*Science*, 5 February 1993, p. 759). Using the latest data compression techniques to compensate for the reduced transmission rate, Galileo will be able to return about 70% of the data that mission planners had hoped for. But that will only be possible if some of the big data loads can be stored for long enough to allow the crippled communications system to catch up.

By late last week, engineers had concluded that the tape recorder probably malfunctioned because its moving parts had stiffened up, says O'Neil: "One of the problems could be that we have used this tape recorder so infrequently." Besides a sticky mechanism, the machine also suffered from the mechanical disadvantage of a nearly empty reel pulling on a full one when controllers sent the order to rewind. Last Friday, when engineers commanded it simply to play back—the easy direction to drive the tape—it worked fine. So engineers plan to limber up the mechanism by working it through a series of exercises; to be safe, they will also avoid recording or playing near the end of the tape, says O'Neil.



J. R. SPENCER/NASA

Out of sight? Without a tape recorder, Galileo could not image this new volcanic spot *(right)* on Jupiter's moon Io.

If that regimen doesn't work, says project scientist Torrence Johnson of JPL, the mission would lose another 20% of the data it was originally expected to gather, with imaging of Jupiter and its satellites suffering the brunt of the losses. The losses would be even greater, says Johnson, if not for the new data compression techniques and a contingency plan to use the on-board computer for data storage.

Still, engineers would be resting easier if Galileo carried a spare tape recorder. But Johnson explains that when the Galileo mission was being planned, its managers "couldn't sell the necessary extra mass and expense. ... Every bit of incremental growth in Galileo was regarded as a dire threat to its existence." And that leaves the Galileo team with nothing to fall back on but innovation. Claims O'Neil: "We've demonstrated we're the most resilient planetary mission ever flown."

–Richard A. Kerr